Mechatrends

Smart Manufacturing…

Its been long time I was thinking on this topic and right now I want to say to you all . To state it simply, it is the use of real-time data and technology when, where and in the forms that are needed by people and machines. But if you are looking for more comprehensive definitions, there are two from leading organizations. According to the National Institute of Standards and Technology (NIST) ***Smart* Manufacturing are systems that are "fully-integrated, collaborative manufacturing systems that respond in real time to meet changing demands and conditions in the factory, in the supply network, and in customer needs."** There are "microprocessors" that make it possible for Smart Phones to operate like mini-computers. There's the "cloud" where almost an unlimited amount of data can be stored and retrieved.

There are "apps" that can be downloaded to help us keep track of what we spend, track the location of people and devices, track how many steps we've walked ... and the list goes on and on. SM utilizes all of the same components, addressing the complexities of security, interoperability and intellectual property for manufacturing.

Furthermore, SM integrates data and information from multiple open and vendor applications and products that can be composed to form new solutions. It can be applied to a single machine line, an entire factory or across a network of suppliers and customers. In fact, linking and integrating among and across all of these in synchronized time is possible.

These improvements make it realistic to manage manufacturing operations with more precision and better collaboration among employees, suppliers and partners. SM will create an open atmospherewhere fact based decisions can be made and decision makers will have the trusted data when it's needed,where it's needed *and in the* most useful form. Solving problems will be based on a total picture.

Furthermore, smarter factories also offer the opportunity to boost employment 2-4 times over the current national manufacturing workforce of 12 million. As SM is adopted, new technology based manufacturing jobs will become available creating *direct manufacturing and non-manufacturing positions.*

Figure : The Model of Smart Manufacturing

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TESLA TURBINE

Most people know Nikola Tesla, the eccentric and brilliant man as the father of alternating current, the form of electricity that supplies power to almost all homes and businesses. in 1913, Tesla received a patent for what he described as his most important invention. That invention was a turbine, known today as the Tesla turbine, the boundary layer turbine or the flat-disk turbine.

the Tesla turbine has a series of closely packed parallel disks attached to a shaft and arranged within a sealed chamber. When a fluid is allowed to enter the chamber and pass between the disks, the disks turn, which in turn rotates the shaft. This rotary motion can be used in a variety of ways, from powering pumps, blowers and compressors to running cars and airplanes. In fact, Tesla claimed that the turbine was the most efficient and the most simply designed rotary engine ever designed.

The Tesla Turbine Engine

The job of any engine is to convert energy from a fuel source into mechanical energy. Whether the natural source is air, moving water, coal or petroleum, the input energy is a fluid. And by fluid we mean something very specific -- it's any substance that flows under an applied stress. Both gases and liquids, therefore, are fluids, which can be exemplified by water. As far as an engineer is concerned, liquid water and gaseous water, or steam, function as a fluid.

At the beginning of the 20th century, two types of engines were common: bladed turbines, driven by either moving water or steam generated from heated water, and piston engines, driven by gases produced during the combustion of gasoline. The former is a type of rotary engine, the latter a type of reciprocating engine. Both types of engines were complicated machines that were difficult and time-consuming to build.

Consider a piston as an example. A piston is a cylindrical piece of metal that moves up and down, usually inside another cylinder. In addition to the pistons and cylinders themselves, other parts of the engine include valves, cams, bearings, gaskets and rings. Each one of these parts represents an opportunity for failure. And, collectively, they add to the weight and inefficiency of the engine as a whole.

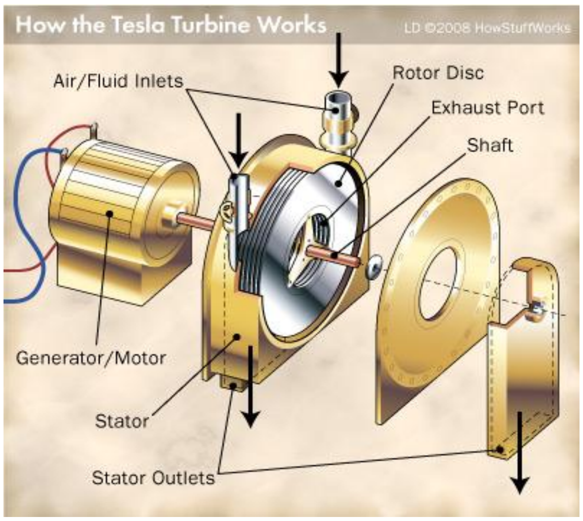

Figure : Workin of Tesla

Bladed turbines had fewer moving parts, but they presented their own problems. Most were huge pieces of machinery with very narrow tolerances. If not built properly, blades could break or crack. In fact, it was an observation made at a shipyard that inspired Tesla to conceive of something better: "I remembered the bushels of broken blades that were gathered out of the turbine casings of the first turbine-equipped steamship to cross the ocean, and realized the importance of this [new engine]"

Tesla's new engine was a bladeless turbine, which would still use a fluid as the vehicle of energy, but would be much more efficient in converting the fluid energy into motion. Contrary to popular belief, he didn't invent the bladeless turbine, but he took the basic concept, first patented in Europe in 1832, and made several improvements. He refined the idea over the span of almost a decade and actually received three patents related to the machine:

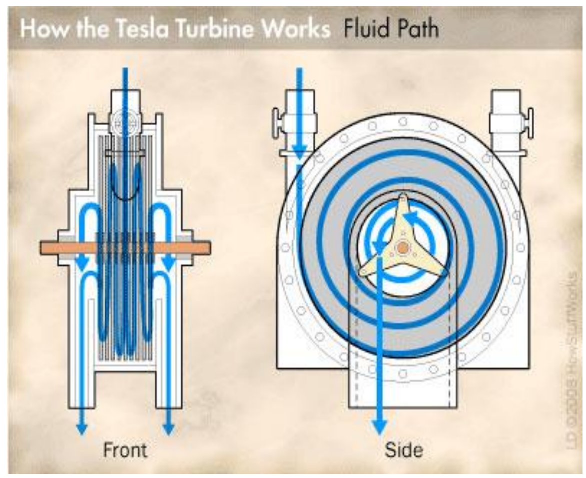

Figure : Schematic Diagram Of Tesla

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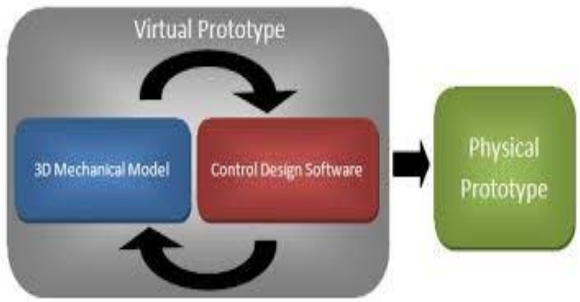
Virtual prototyping

Virtual prototyping is a method in the process of product development. It involves using computer-aided design (CAD), computer-automated design (CAutoD) and computer-aided engineering (CAE) software to validate a design before committing to making a physical prototype. This is done by creating (usually 3D) computer generated geometrical shapes (parts) and either combining them into an "assembly" and testing different mechanical motions, fit and function. The assembly or individual parts could be opened in CAE software to simulate the behavior of the product in the real world



Today, manufacturers are under pressure to reduce time to market and optimize products to higher levels of performance and reliability. A much higher number of products are being developed in the form of virtual prototypes in which engineering simulation software are used to predict performance prior to constructing physical prototypes. Engineers can quickly explore the performance of thousands of design alternatives without investing the time and money required to build physical prototypes. The ability to explore a wide range of design alternatives leads to improvements in performance and design quality. Yet the time required to bring the product to market is usually reduced substantially because virtual prototypes can be produced much faster than physical prototypes

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